

Establishment of a novel rat model for deep tissue injury deterioration

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Abstract	<p>Deep tissue injuries (DTIs) can become significant problems because of their rapid deterioration into deep pressure ulcers. Presently, no animal model of DTI deterioration has been developed. By concentrating pressure and shear stress in deep tissues while minimising pressure and shear stress in the overlying skin, we produced an effective rat model of DTI deterioration. Two-dimensional finite element method (FEM) simulated the distribution of pressure and shear stress under several pressure-loading conditions. FEM showed that concentrated shear stress in deep tissue with minimum shear stress in the overlying skin could be created by using a prominence and a cushion, respectively. On the basis of the results of FEM analysis, we selected suitable conditions for testing the rat DTI deterioration model. The compressed area was macroscopically observed until day 13, and histopathologic analysis via haematoxylin and eosin (H&E) staining was performed on days 3, 7 and 13. H&E staining showed that the distribution of tissue damage was similar to the predicted FEM results. Deep ulceration and tissue damage extending from deep tissues to the overlying skin and surrounding tissues were observed in the DTI deterioration model, which are similar to the clinical manifestations of DTI deterioration. In conclusion, a representative DTI deterioration model was established by concentrating high shear stress in deep tissues while minimising shear stress in the overlying skin. This model will allow a better understanding of the mechanisms behind DTI deterioration and the development of preventative strategies.</p>
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